# ENVIRONMENTAL ASSESSMENT

Environmental Assessment Number: OR-054-01-035
Title of Action: **Paulina Aspen/Forest Management Project**
Location of Proposed Project: T15S, R22E, Sec. 24
Bureau of Land Management Office: Prineville
Resource Area: Central Oregon

## I. PURPOSE AND NEED

The primary purpose of the proposed project is to restore and protect quaking aspen (*Populus tremuloides*) stands and help reverse a declining trend for this important vegetative community on the BLM Prineville District. A secondary purpose is to improve wildlife habitat diversity and long-term forest health, including the maintenance and enhancement of old forest structure. The reduction of ground and ladder fuels for long-term stand protection against large-scale wildfire would also be an integral part of the proposal.

Quaking aspen stands (or "clones") occur infrequently on the Prineville District of the BLM, comprising less than one percent of forested areas. Aspen clones may survive for many centuries, periodically replacing dead stems by producing suckers from an extensive root system (Bradley et al. 1992). Aspen stands in the Central Oregon area, as with aspen stands throughout the western United States, are on a declining trend. Comparisons of data from historical records indicate that the area occupied by aspen has declined by 60 to 90 percent or more since European settlement (Lachowski et al. 1996). The decline is also apparent in the overall health of aspen stands. Many aspen stands contain old-age trees and have not successfully regenerated for 80 years or longer (Mueggler 1989a, 1989b). This characterization is true of the aspen stands within the proposed project area (See "Description of the Existing Environment" for additional discussion of aspen condition in the project area).
.
Current literature describes fire suppression and resulting competition from conifers as a significant contributing factor to the decline of aspen in the west. Many sources also name over-use by big-game and livestock as other contributing factors. The document, An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins - Volume II states, "Aspen was also in steep decline...in response to fire exclusion and excessive grazing pressure by livestock and native ungulates."

Aspen is considered a seral species, that is, it quickly occupies a site after fire or some other major disturbance (Shepperd and Engelby 1983). Aspen is shade intolerant, requiring nearly full sunlight to thrive. An established aspen clone also depends on periodic disturbances for regeneration, usually by growing abundant root suckers from the lateral root systems of overstory trees. In the western United States, sexual reproduction (reproduction from seed) by aspen is very rare (Bradley et al. 1992). Without periodic disturbance to reduce competition and kill old stems, and thus induce suckering,

aspen stands will decline in area, density and health. Tree species more tolerant of shade such as ponderosa pine (*Pinus ponderosa*) and western juniper (*Juniperous occidentalis*) will become established and compete with aspen, eventually crowding it out. The dense conifer shade prevents aspen suckers from becoming established. Without suckering, an aspen clone will gradually decline and eventually die out altogether. Aspen stands within the project area contain dense ponderosa pine and juniper that have encroached from adjacent areas.

Aspen communities are a vital component of forest ecosystems. Aspen requires specific soil and micro-climatic needs, particularly high soil moisture during the growing season and full sunlight, to achieve maximum potential. Consequently, aspen is limited to relatively small areas in Central Oregon where the proper conditions exist. These communities are especially important on arid landscapes because they provide a high degree of vegetative diversity. Diverse habitats provide food and nesting opportunities for numerous wildlife species.

Old structure ponderosa pine habitat, as with aspen, has declined locally and regionally in the interior west. The project area contains scattered larger diameter (greater than 18 inches dbh) ponderosa pine with dense understories of pine and juniper. The area had been selectively logged with at least two previous entries from the 1950s to 1970s. The logging favored the removal of large ponderosa pine, leaving the smaller diameter trees and opening the stand, allowing a proliferation of pine and juniper reproduction. The human influence of fire suppression over the last century has exacerbated the situation by not allowing the natural thinning effect of periodic low-intensity fire. Numerous studies of natural fire cycles in the ponderosa pine type indicate an average of five to 20 years between fire events (Weaver 1959, Agee 1990). As a consequence of long-term fire exclusion in the project vicinity, the remaining large pine overstory trees are under severe competitive stress from the dense understory of pine and juniper. Stress from overstocking is reducing the growth and health of overstory trees and predisposing them to attack by western pine beetle and a variety of other insects and disease. Mortality in the larger pine in the project area is occurring at an unnaturally high rate. In addition, high fuel loads from previous logging slash, decades of natural fuels build-up, and dense pine and juniper reproduction, present a high potential for stand-replacement wildfire.

The stand structure provided by old-age ponderosa pine, with its large trees and associated snags and down logs, provides important habitat conditions and is an integral part of a healthy forest. A variety of wildlife species depend on the complex and unique habitat components provided by old structure pine habitat to maintain viable populations. Old forest communities also provide high scenic values and preservation of natural gene pools. A healthy and resilient forest, including old or late seral stands, is a result of a combination of dynamic natural biological and physical processes occurring over a period of time. Post-settlement human intervention has created unnatural conditions that have contributed to the decline of old-forest structure in the project area. Active management will be necessary to restore old-stand structure and reintroduce or mimic natural processes to maintain the integrity and long-term function of an old forest ecosystem.

Specific project objectives are:

- Restore and maintain long-term ecological function for increased habitat diversity and resiliency to insects, disease and wildfire.
- Protect existing aspen communities and restore the previous dominance of aspen in the project area.
- Maintain and re-create old-structure ponderosa pine forest habitat.
- Reduce fuel loading to minimize potential for large-scale stand-replacement wildfire.

**Policies and Management Direction**

The proposed project is subject to and in conformance with the **Brothers/LaPine Resource Management Plan (RMP)**, July, 1989, which is available for review at the Prineville District BLM office located at 3050 NE 3rd Street, Prineville, Oregon. Specific RMP management direction includes:

"...non-game species habitat management will be accomplished by maintenance or enhancement of vegetative structure and diversity." "...other habitat improvement projects will be implemented where necessary to stabilize and/or improve unsatisfactory or declining wildlife habitat condition." (p. 97)

"...will not preclude the use of prescribed fire (both planned and unplanned ignitions) to reduce fuel loads, manage habitat and forage, or control vegetation..." (p. 101)

"Forestland will be managed to minimize losses or damage to commercial tree species from insects and disease." "Maintaining or improving site productivity will be a basic objective in all forestry practices." (p. 39)

The Director of the BLM Oregon/Washington State Office, Elaine Zelinski, has encouraged BLM District and Field Offices to implement projects consistent with Governor John Kitzaber's report, **Forest Health and Timber Harvest on National Forests in the Blue Mountains of Oregon** (Johnson et al. 1995). The report, prepared by a group of university ecologists, biologists, forest policy specialists, and others from related disciplines, includes 12 major points regarding forest ecosystem conditions and recommendations for restoration. The first three major points of this report are as follows:

1. The east-side "forest health problem" should be defined broadly to consider forests, streams, and watersheds.

2. Most of the forest in the National Forests of the Blue Mountains is alive, but much of it has recently experienced severe problems:

    a. Sizeable amounts of certain species, such as Douglas-fir and true firs, have died as a result of overcrowding on drier sites, drought, and insects. Historical forest

management practices (fire exclusion, harvest practices) have contributed to the problems.

b. Large stand-replacing (crown) wildfires have recently occurred, due to a buildup of fuels, in forests where that type of fire behavior was historically infrequent.

c. A major portion of the live forest is under stress because stands are too dense, especially in the true fir/Douglas-fir understories beneath pines and larch, which increases the likelihood of future mortality in both the understory and overstory.

3. Restoration treatments, including thinning and fuel reduction, could reduce the risk of loss from insects and fire on large areas of these forests.

Public debate on overall ecological conditions and uses of lands managed by federal agencies in this geographic region has also led to the establishment of the **Interior Columbia Basin Ecosystem Management Project (ICBEMP)**. While more encompassing, the Scientific Assessment (Quigley, et al. 1996) part of the ICBEMP restates many of the conclusions and recommendations by the Governor's team. Specific guidelines stated within the ICBEMP Proposed Decision include:

"On sites where aspen is currently being replaced by conifers or where stem exclusion/closed canopy stages are declining in health, consider restoring seral stages dominated by aspen."

"On sites dominated by ponderosa pine, Douglas-fir, and/or western larch, consider removing ladder fuels and reducing stand density to a level at which a fire cannot spread in the tree canopy consistent with landform, climate, and biological and physical characteristics of the ecosystem."

"Consider restoring late seral structure in large blocks of habitat that are representative of the likely pattern that occurred with historic disturbance events."

The condition of forest stands within the Paulina Aspen/Forest Management Project Area are representative of those widespread forest health issues occurring throughout much of the east- side Cascades and Blue Mountain forests. Such conditions are generally regarded as "unstable" due to their susceptibility to insect attack, disease, and wildfire. Active restoration management and re-introducing natural processes, such as low-intensity fire, are considered necessary in order for these plant and animal communities to maintain long-term ecological viability and resiliency to insects, disease, and wildfire.

## II. PROPOSED ACTION AND ALTERNATIVES

Alternatives were based on key issues gathered from the interdisciplinary analysis team, Governor Kitzaber's Report, and the ICBEMP Scientic Assessment. The three key issues that emerged were: 1) decline of aspen stands, 2) reduction of old structure forest habitat, and, 3) fire exclusion resulting in a decline in bio-diversity and increased potential for large wildfire. All three action alternatives address the key issues and would occur on approximately the same number of acres within the 106 acre project area. The differences are in the prescriptions applied and the timing and intensity of treatments. The action alternatives include more specific project design features and mitigation/monitoring measures as described in Appendix A.

### A. Alternative 1 (Proposed Action)

Alternative 1 (proposed action) would be a combination of the following treatments: commercial and non-commercial thinning of ponderosa pine on approximately 80 acres, non-commercial thinning of juniper, cutting/girdling of up to 20 acres of aspen, prescribed underburning of up to 106 acres, and fencing of up to 40 acres of aspen stands. Treatments would be implemented sequentially, as determined necessary, over a period of three to five years. Pine and juniper thinning would be implemented the first year followed by underburning of only the pine stands in the second year. Results of thinning and burning treatments would be monitored in the aspen stands for the first two years. Subsequent treatments in the next two to three years could include one or more of the following: underburning in the aspen stands, cutting or girdling of up to 50 percent of overstory aspen, and constructing big-game and cattle exclosure fences around some or all aspen stands (about 40 acres). Trial cutting and/or burning of portions of aspen stands with different prescriptions and evaluating results would be an option. Root severing around overstory trees, with a hand operated ditcher or other hand operated tool, instead of cutting/girdling would also be an option considered. Each subsequent treatment would be prescribed based on aspen response from the previous treatment. If monitoring determines that project objectives have been achieved in the aspen stands with thinning and prescribed fire, then additional burning, cutting of aspen stems or roots, and fencing may not be necessary.

The commercial treatment would focus on stocking control in the understory of pine stands and removing pine and juniper competition in the aspen stands. Trees would be selectively marked with emphasis on removing smaller (less than 18 inches dbh), younger (less than 120 years old) suppressed and intermediate trees and retaining larger, dominant trees. Target basal area per acre would be in the 70 to 90 square feet range, although it would vary based on stand condition, structure, and presence/absence of aspen and large ponderosa pine. For example, where aspen or large ponderosa pine are present, or where there is heavy infestation of dwarf mistletoe, thinning would be to a wider spacing than in a healthy, denser second-growth pine stand. This treatment would remove up to 250 mbf (500 ccf). Up to 50 trees greater than 12 inches dbh would be girdled rather than cut to provide additional hard snag habitat. The operation would be accomplished by a low ground pressure harvester/forwarder system or with conventional felling/skidding and designated skid trails.

Non-commercial thinning would cut suppressed, diseased, and competing pine in the size class of two feet in height to eight inches diameter at breast height (dbh). Resulting leave tree density in thinned areas would vary according to stand type and condition but generally would range between 50 and 120 trees per acre (ie. larger, older trees would occupy more space per tree than smaller, younger trees). Non-commercial thinning would be accomplished with chainsaw. Some patches of dense reproduction would be left untreated for hiding cover. Juniper 18 inches in diameter and greater, and others less than 18 inches with old-tree characteristics (gnarled trunk and branches, decay and cavities, rounded or flat-topped crown, abundant lichen growth), would be retained for habitat diversity.

The prescribed underburning treatment in the pine stands would occur in the spring or fall after the thinning treatment. Monitoring results would determine whether or not a second burning entry would be needed in the pine stands or to further stimulate root suckering in the aspen stands. Some limited hand fireline construction may be necessary to partition the project area into smaller, more manageable units for different burning prescriptions based on stand type, density, and specific objectives.

Cutting and burning treatments would be monitored for at least three years after implementation for aspen response and ungulate browsing. If aspen response is meeting objectives at that point, fencing would not be installed. If ungulate browsing was determined to be impeding aspen response, then fencing would be installed. Fence exclosures, if necessary, would be temporary and constructed of re-usable materials. Fencing would likely be constructed of eight foot high plastic mesh supported by eight foot steel fence posts and heavy gauge wire. The bottom of the fence would be anchored with stakes or weighed down with rocks and large woody debris. This type of fence has been successful for excluding deer, elk and cattle on similar projects in the past. After aspen reproduction is established and mostly beyond browse range (at approximately six to eight feet tall), fencing would be removed.

**B. Alternative 2**

Alternative 2 would emphasize non-commercial thinning of ponderosa pine and juniper on 80 acres as the primary treatment. Non-commercial thinning would be as described under Alternative 1, except that the upper dbh limit for ponderosa pine would be nine inches instead of eight inches and the treatment would be followed by mechanical fuels treatment. Juniper, 18 inches dbh and greater, and others less than 18 inches with old-tree characteristics (gnarled trunk and branches, decay and cavities, rounded or flat-topped crown, abundant lichen growth), would be retained for habitat diversity. A crawler tractor with a brush rake would treat thinning and natural fuels by piling and scattering fuels concentrations on an estimated 30 percent of the 80 acres of non-commercial thinning. Heavy fuel concentrations would be machine piled in stand openings and lighter concentrations would be spread out such that the fuel profile is less than 18 inches in height and total residual fuel loading would not pose a risk of stand replacement wildfire. Hand piling was considered but rejected as being cost-prohibitive. This alternative would include exclosure fencing, if necessary, as described under Alternative 1.

### C. Alternative 3

Alternative 3 would emphasize prescribed underburning in both pine and aspen stands as the primary treatment. No pre- or post-burn cutting would occur. Due to the high initial fuel loads and the presence of ladder fuels, burning would be accomplished with more than one entry over a period of 3-5 years. A phase-in approach would be used with the first ignition occurring in the spring under cool burning conditions. This entry would be used to burn off some of the high initial ground fuels and surface litter layer. Second and possibly third entries would occur in the spring or fall under modified burning conditions which would allow higher levels of natural fuels consumption and some fire thinning of understory pine and juniper. Second and third burning entries would require attaining greater heat and higher flame lengths compared to Alternative 1 in order to achieve similar objectives. Trial burning of portions of aspen stands with different prescriptions and evaluating results would be an option. Machine fireline construction using a crawler tractor with dozer blade would be used to partition the project area into smaller, more manageable units for different burning prescriptions based on stand type, density, and specific objectives. This alternative would include exclosure fencing, if necessary, as described under Alternative 1.

### D. Alternative 4 (No Action)

This alternative would provide no active stand management at this time and leave the project area in its current condition. Ongoing programs such as grazing management and fire suppression would continue according to management direction in the Brothers-LaPine RMP. Re-evaluation for prescribed fire could occur at a later time based on the High Desert Prescribed Burning Environmental Assessment (1998).

## III. DESCRIPTION OF THE EXISTING ENVIRONMENT

### A. Location

The project area encompasses approximately 106 acres and is located 10 miles northwest of Paulina in T15S, R22E, Sec. 24, Crook County, Oregon (see attached map). The project area is accessible from the north through the Ochoco National Forest via U.S. Forest Service Roads 42, 4260 and 4260.350. Existing BLM roads provide access to the interior of the project area. Key components of the environment involved in the project area or affected by the proposed action are described below.

### B. Watershed/Soils

The project area is in the southern Ochoco Mountains within the Blue Mountains Physiographic

Province. The project lies in the Roba Creek subwatershed of the Paulina watershed. Paulina Creek is a tributary to the Crooked River and lies within the South Fork/Beaver Creek sub-basin. Elevation ranges from 4100 to 4320 feet. Slopes range from 0 to 25% with aspects of northeast to southwest.

Soils are predominantly the Westbutte-Gardone Association with some inclusions from the Canest Series as described in the USDI Interim Soil Survey Report of the Brothers Area. The Westbutte-Gardone soil is generally deep and well-drained. It formed in weathered material derived from lava rock and ash. The surface layer is a dark grayish brown loam up to seven inches thick. The next layer is a coarser sandy loam with increasing cobbles with depth. Depth to bedrock is 20 to 60 inches. Permeability is moderate to rapid. Runoff is slow to medium and the hazard of erosion by water is slight to moderate. Several small seeps (less than 1/10 acre) occur in the project area, particularly in the vicinity of the aspen stands. The seeps create localized soil profiles with subsurface irrigation or saturated soil conditions during part of the year. The deeper soils and additional subsurface water availability in portions of the project area make this site higher in productivity relative to adjacent sites in the project vicinity. Canest soils also occur within small lava tablelands within and on the transition edges of the project area. These are very shallow, well drained soils with exposed lava bedrock on the flats to slopes of up to eight percent. Some minor erosion is occurring as a result of rutting and drainage problems on the existing logging access road and attempts to drive cross-country from the end of this road.

**C. Vegetation**

A majority of the project area is forested with an overstory of predominantly ponderosa pine mixed with some western juniper. A large stand of quaking aspen and several smaller groups of aspen are present in and among the ponderosa pine and juniper within the project area.

The project area contains one of the largest aspen stands on the BLM Prineville District. This stand is located in approximately the center of the project area. Several other groups of aspen occur on the periphery of this larger stand and a few other small aspen pockets occur scattered within the project area. A majority of the aspen trees are mature and in a declining status. A 19 inch dbh aspen was bored and aged at 70 years. Several trees in the largest aspen stand exceed 18 inches in diameter. There is a high degree of mortality with many of the largest aspen trees dead and down in a jack-strawed arrangement. Several small groups of aspen within 1/3 mile of the large central aspen stand have completely died out within the last 20 years, leaving only a few old dead snags and down stems to indicate their former presence. These isolated groups of live and dead aspen suggest that, at one time, there was likely a much larger and more contiguous aspen stand that would have dominated most of this sideslope and possibly extended down into the Paulina Creek and tributary drainages. The project area is now dominated by pine and juniper with aspen having a subordinate ecological position.

Remaining live overstory aspen, especially those overtopped by pine and juniper, are in poor health with a high incidence of stem and root decay. Nearly all the mature trees have stem injuries from falling trees and deer and elk rubs, providing infection opportunities for pathogens and insects. Heavy shading

from intermingled pine and juniper is suppressing aspen root suckering. When the few new suckers do emerge, they are heavily browsed by ungulates. There is no evidence of fire in recent decades which would have promoted suckering. Consequently, there is almost no regeneration occurring to replace the older trees that are dying out.

Ponderosa pine stands are generally multi-layered with a scattering of larger trees (greater than 18 inches dbh) throughout much of the project area. These trees are the remnants of earlier logging entries (at least two in the last 50 years). Many large trees were cut with these selective logging entries (one old stump was measured at 54 inches diameter). There are a few relatively productive local sites where soils are deep with subsurface water availability. One open grown 23 inch dbh ponderosa pine showed current growth at six rings per inch and 102 years old. Most stands on the more productive sites are very dense with up to 1,000 stems per acre and 150 square feet of basal area. Seedlings and saplings beneath the overstory are generally suppressed with poor crown development. Many of the intermediate and co-dominant trees are also under severe stress from overstocking of young pine and competition from invading juniper.

Many of the larger trees have been killed by western pine beetle in recent years. Other damaging agents such as disease, lightning, and windthrow have also taken a toll on the large tree component. The north portion of the project area, in particular, has a severe infestation of dwarf mistletoe which has killed or contributed to the mortality of several large diameter trees.

Understory vegetation includes Idaho fescue, sagebrush, elk sedge, snowberry, huckleberry, rosa spp., ribes spp., dwarf Oregon grape, arnica, oceanspray, chokecherry, mountain mahogany, and juniper and ponderosa pine seedlings/saplings. There are localized pockets of introduced houndstongue and thistle in portions of the project area.

**Grazing -** The project area is within two separate livestock grazing allotments, the Paulina Creek (0051) and Indian Creek (0016) Allotments. The fenceline between the two allotments runs north-south and bisects the project area almost in equal halves. The pasture in the Paulina Creek Allotment, which contains the west half of the proposed project area, is authorized for grazing (35 animal unit months - AUMs) every year from April 1 to May 15. The permittee has opted not to graze this pasture for the last three years. The Indian Creek Allotment, which contains the east half of the project area, is grazed every other year during the period May 15 to June 15. There are 81 active AUMs in this allotment and the allotment is scheduled to be grazed in 2001.

**D. Wildlife**

The project area has approximately 40 acres of ponderosa pine dominated stands with scattered large

pine and a second canopy of smaller pine and juniper. There is also another 40 acres of aspen mixed with pine in the overstory and smaller pine and juniper in the understory. Both the large pine and the aspen habitat types have been identified as being below the Historic Range of Variability (HRV) within surrounding watersheds, and both play a vital role in many species life cycles.

Aspen stands function as habitat for numerous wildlife species. Due to the diversity of under-story plants like rose, snowberry, aspen suckers, and rich components of grasses and forbs aspen stands provide high quality foraging opportunities for numerous species. Aspen stands typically have high amounts of disease and damage within the stand. This provides numerous cavity nesting opportunities for primary and secondary cavity users including many neotropical migratory birds. The rich plant variety and usual association with surface water result in high insect concentrations as well. All of these elements make aspen one of the most beneficial plant communities for wildlife.

Open pine stands dominated by large trees also provide critical habitat components for many species, especially primary and secondary cavity nesters. Groups of large pine trees also provide cover qualities used by some species for nesting, large snags and down wood , and thermal cover for game animals.

Numerous game and non-game species have habitat potential in the general project area, including: deer, elk, mt. quail, bear, cougar, turkey, ruffed grouse, striped skunk, porcupine, coyote, redtail hawk, and many other species. Many species utilize areas like the project area for reproductive or rearing purposes due to the presence of high quality forage and water in one location.

Existing open road densities are above desired levels. The project area is relatively flat making it difficult to effectively close roads. Disturbance from existing roads reduces the habitat security and takes land out of forage production. Within key elements such as aspen stands and riparian areas, road influence is magnified due to the importance of these habitats. Current densities of second growth pine and juniper are providing more hiding cover than historically existed and mitigating the increased road densities.

The project area has snags and down log levels representative of a drier pine site that would have typically burned more frequently. The increased mortality of large aspen trees has added to the number of snags.

**E. Threatened, Endangered, and Special Status Species (TE&S)**

The following threatened or sensitive species **have potential habitat in the project area:**

**Northern Bald Eagle** (Haliaeetus leucocephalus): Threatened (USFWS, BLM OR, and State of Oregon)
**Canada Lynx** (Felis canedensis): Threatened (USFWS), Threatened (BLM OR)
**Townsend's big eared bat** (Corynorhinus townsendii): Category II (USFWS), Sensitive (BLM OR)
**Northern Goshawk** (Accipiter gentilis): Sensitive (BLM OR)
**Northern Pygmy Owl** (Glaucidium gnoma): Sensitive (BLM OR)
**White-headed Woodpecker** (Picoides albolarvatus): Sensitive (BLM OR)
**Black-backed Woodpecker** (Picoides arcticus): Sensitive (BLM OR)
**Pygmy Nuthatch** (Sitta pygmaea): Sensitive (BLM OR)
**Fisher** (Martes pennanti): Former Federal Candidate (USFWS), Sensitive (BLM OR)

The project area and vicinity (within 1/2 mile) was surveyed for bald eagle and northern goshawk. No individuals were located. In 1979 a goshawk was observed in the project area. Initial survey efforts in 2000 detected a reproductive goshawk pair 1 1/4 miles south of the project area. Formal surveys were not conducted for the rest of the species with potential habitat in the project area. Presence was assumed for analysis purposes for these species. The following species would have the highest probability for use in the project area: pygmy owl, white-headed woodpecker, black-backed woodpecker, and pygmy nuthatch. Use by bald eagle, Townsend's big eared bat, and fisher would be limited to incidental foraging or dispersing.

Critical habitat components for sensitive species are the health of the aspen stand and the large diameter ponderosa pine trees. Existing higher road densities are reducing the habitat suitability for lynx and fisher.

Documentation of surveys, habitats, and effects analysis are contained in the Biological Evaluation\Biological Assessment Review (Project File - BLM Prineville District Office).

Peck's long-bearded mariposa lily (*Calochortus longebarbatus* var. *Peckii*), a Bureau Sensitive species, was suspected in the area. The District Botanist conducted a survey of the project area and vicinity on July 20, 2000 but no *Calochortus* or any other species of concern were identified.

## IV. ENVIRONMENTAL CONSEQUENCES

The following environmental consequences of implementing each of the alternatives are described considering the application of project design features and mitigation measures as described in Appendix A and as directed in the Brothers/LaPine RMP.

### A. Watershed/Soils

Alternative 1 (Proposed Action)

For the commercial operation, most soil impacts would be confined to existing roads, skid trails and landings from previous logging entries. Soil compaction and displacement would also occur on some additional designated skid trails and landings. If a low ground pressure harvester/forwarder system is used, then additional light soil displacement and compaction would occur over a greater area but to a lesser degree than if a conventional skidder was used on designated trails. Harvesters and forwarders are mounted on low-pressure balloon tires and generally make only one or a few passes. With low-ground pressure harvestor/forwarder equipment, an estimated 50 to 60 percent of the treatment areas could be impacted with one or more passes. With conventional rubber-tired skidders and designated skid trails, an estimated 20 to 30 percent of the treatment areas could be impacted with one or more passes, mostly on existing skid trails from previous logging. Operations would be restricted to the driest part of the year (July 15 to September 30) to further limit soil impacts. In addition, operations would be suspended for a period of time in the event of a significant precipitation event during the summer season. Equipment would not be allowed in wet areas (seep areas). Removal of harvested bolewood would result in a small percentage loss of site nutrients and organic matter. The non-commercial hand thinning of juniper and small pine would have negligible direct soil impacts.

The prescribed burn would be implemented during carefully monitored conditions of weather and fuel moisture such that fire intensity and resulting soil impacts would be low. The prescription would provide for a mosaic-type burn that would result in a random and irregular burn pattern with many unburned fingers and islands left within the gross prescribed burn area. An estimated 60 to 80 percent of the gross burn area would actually be burned. Even within the burned areas consumption would not be complete. Most of the larger down or suspended logs would be left unburned or partially burned. When soil moisture is high, most of the large logs and much of the lower duff and litter layer would be left intact. Additional measures such as slash pull-back, handlines and avoidance would be used to protect large down logs and snags. Concentrated areas of intense local heat, such as a stump burning, would eliminate all surface organic matter and produce a sterilization effect in the upper soil layer of small areas. Prescribed burning would consume organic matter and volatilize nitrogen and other nutrients but not at a level beyond that which would have occurred under a natural fire regime. Burning provides a short-term release of available nutrients into the soil which would accelerate grass and herb response. The need for fireline construction would be reduced due to the break-up of fuel continuity with the thinning treatments. Any needed firelines would be constructed by hand and dictated by actual resulting fuel loading and conditions existing prior to burning.

Minor short-term (three to five years) soil erosion and sedimentation, beyond background levels, could occur following soil and vegetation disturbance from thinning and burning treatments. However, due to gentle slopes, off-site displacement of soil would be very low. Longer-term effects (beginning one growing season after burning) would be positive due to greater ground cover protection from increased grass, forb and shrub production. In addition, non-commercial thinning slash would be left on-site to provide additional soil cover for erosion control, nutrient cycling, organic matter input, browse protection for emerging grasses and forbs, and amelioration of micro-climatic extremes near the soil surface. Some of these fuels would get burned off with the prescribed burn but an estimated

20 to 40 percent would be left in a mosaic pattern.

Considering the flat to moderate slopes, coarse sandy/rocky soils, seasonal restrictions, low-impact logging techniques, and retention of woody debris; soil impacts would be expected to be relatively minor. Natural freeze/thaw action and other biological and physical processes would alleviate soil compaction over time. Project-related road and skid trail closures and spreading of slash would aid recovery by protecting exposed surface soils and restricting off-road vehicle traffic.

Alternative 2

Alternative 2 would have less surface area impacted by heavy equipment than Alternative 1 since no commercial logging would occur. This alternative would have a slightly higher degree of soil compaction and displacement on a smaller area, however, due to the machine piling and scattering operation. Machine piling, in particular, produces a relatively higher degree of compaction and displacement due to many passes needed under high power. An estimated 30 percent of the project area would require machine piling/scattering due to extreme fuel loads (approaching 100 tons per acre after non-commercial thinning).

This alternative would not provide for prescribed fire and, therefore, would provide a higher level of organic matter and long-term nutrient retention.

Alternative 3

Alternative 3 would have similar soil effects from prescribed fire as those described for Alternative 1. Effects from fire under this alternative would be somewhat more pronounced, however, due to the need for two to three burn entries, higher flame lengths, and additional machine fireline construction. Additional fireline would be needed to allow better timing and area control due to more variable vertical and horizontal fuel loading. An estimated five to 10 percent of the treatment area would be impacted by fireline construction. Any needed firelines would be rehabilitated by covering with natural debris such as down logs, branches, rocks, etc.

Alternative 4 (No Action)

The No Action Alternative would not result in any impacts to the soil beyond current background soil disturbance and sedimentation levels. Some erosion from occasional off-road vehicle traffic would continue in the project area. A stand replacement wildfire would be much more likely under the No Action Alternative. A large-scale wildfire in this area would create more surface erosion, sedimentation of streams (outside of project area), and reduced stream shading relative to implementation of Alternative 1.

**B. Vegetation**

Alternative 1 (Proposed Action)

Based on past experience and research/case studies of other aspen treatments, thinning and burning should provide the desired effects on aspen stands of reversing the encroachment of pine and juniper, improving the health and vigor of existing aspen, and promoting root suckering for increased aspen stand viability, density and extent.

The initial treatment of thinning to reduce pine and juniper competition would open stands to increased sunlight which, probably more than any other factor, would contribute greatly to aspen recovery and vigorous root suckering. Underburning of the pine stands would further reduce competition by retarding pine and juniper reproduction and some of the other competing understory perennial grasses and shrubs. In addition, thinning and burning would free up additional available water and nutrients for use by aspen and other remaining vegetation. Soil disturbance cause by treatments would also have the added effect of stimulating the aspen root system to respond with suckering.

If necessary, additional cutting/girdling and/or direct burning of aspen stands would be prescribed. These treatments would mimic natural disturbance processes such as windthrow and natural low-intensity fire to further induce reproduction. Cut stems of pine, juniper and aspen left in and among the standing aspen trees would discourage ungulate browsing, rubbing and trampling damage. If implemented, construction of temporary exclosure fencing would protect existing and emerging aspen from animal damage. The net effect of the entire treatment combination is expected to be larger, denser stands of healthy and reproducing aspen which would again dominate the site.

The thinning, and to a lesser extent, the burning treatments would also achieve the desired effect of enhancing existing and promoting additional old ponderosa pine forest habitat outside of the aspen stands. Reducing tree and understory vegetative competition would redistribute the finite available resources of water, nutrients, space and light to fewer, larger trees. Where old trees are present, stand structure would be moved from a multi-layer tree canopy, dominated by dense smaller trees and understory reproduction, towards a single-layer canopy dominated by larger, widely spaced individual and small groups of trees. Stand density reduction would relieve stress on existing large trees and reduce mortality due to insects and disease. Most of the smaller trees with the heaviest dwarf mistletoe infections, especially in the north portion of the project area, would be removed. The largest overstory trees with dwarf mistletoe would be retained but would be isolated by removing understory trees within a 20 to 30 foot radius. This would help control the spread of dwarf mistletoe while retaining large structure habitat and increasing the longevity of these infected trees. Thinning would also allow intermediate sized second-growth pine to grow much faster to provide future large tree habitat in areas lacking large trees within the project area.

Thinning and underburning would reduce the threat of catastrophic wildfire by reducing the unnaturally high level of ground and green ladder fuels that have built up over a century of fire suppression. Prescribed fire would remove a high percentage of the fine “flashy” fuels and kill many of the smaller

seedlings that thinning treatments would not be able to remove. The post-treatment modified fuel loading and profile would significantly lower the intensity of the next wildfire when it does occur. A reduction of stems per acre, a "lifting" of the height of the average tree canopy layer, and the thicker bark of the larger remaining trees, would allow stands to tolerate the re-introduction of lower intensity fire, whether from prescribed or natural ignitions. Since ponderosa pine evolved with natural fire as an important environmental influence shaping its structure, reintroduction of fire is necessary to maintain the long-term integrity of this valuable old forest structure habitat.

Understory non-tree vegetation would also show a change in structure and composition with thinning and burning treatments. A reduction in the tree canopy layer above by thinning and a reduction in the understory vegetation by burning would produce a different micro-climate near the ground. A shift in species composition and structure would occur favoring more shade-intolerant grasses, forbs, and some shrubs. For the first year or two after treatment, total understory bio-mass would be reduced on an estimated 60 to 80 percent of the gross burn area, followed by a gradual increase in total understory vegetation until it exceeded pre-treatment levels. The recolonization and establishment of early seral species would be greatly accelerated by the release of available nutrients by prescribed fire. Understory vegetation would be dominated by grasses and herbaceous species for several years but would gradually transition back toward a shrub-dominated community. The drier sites would remain in perennial bunchgrasses as the late seral understory community. Weed species, such as houndstongue and thistle could increase post-treatment. The spread of weeds would be controlled with measures such as timing of operations and spot removal of isolated populations. Understory vegetation in the unburned 20 to 40 percent of the gross prescribed burn area would be mostly unaltered and retain its pre-treatment species composition and structure.

Alternative 2

Non-commercial thinning applied to aspen stands under Alternative 2 would have similar effects as those described under Alternative 1. Aspen response would likely be less, however, due to the retention of more ponderosa pine trees greater than nine inches dbh in and among the aspen. In some of the more productive areas, the density of pine trees greater than nine inches dbh left in the aspen stands would still provide nearly a closed canopy structure. In these areas, there would not be enough exposure to sunlight and disturbance stimulus to induce much, if any, suckering. Aspen would continue to decline in areas with a dense mature overstory.

Non-commercial thinning would also provide only a partial benefit to the large diameter pine and dense second-growth stands. Inter-tree competition would still be intense in the areas with a dense overstory canopy. Mistletoe, western pine beetle and other insects/disease would continue to cause mortality and losses in growth, although not as much as in the No Action Alternative.

The lack of prescribed fire under pine or aspen stands would not provide the added benefits of this treatment. Heavy competition from dense understory shrubs such as snowberry and pine/juniper trees

less than two feet in height would continue in most of the project area. Limited mechanical reduction of understory competition would occur in the estimated 30 percent of the treatment areas that would require machine piling and/or scattering. The threat of a wildfire reaching the crown would still be possible, although not as likely as under the No Action Alternative.

Alternative 3

The effects of prescribed fire on vegetation would be similar to those described for prescribed fire under Alternative 1. As with non-commercial thinning only, under Alternative 2, aspen and overstory pine response would likely be less with just a prescribed fire treatment than it would under Alternative 1 with a combination treatment. The application of prescribed fire is inexact and generally non-discriminatory. Therefore, results would be highly variable. Despite the use of different prescriptions and multiple entries, some areas would burn relatively hot and some areas would not burn at all. Some inconsistent understory thinning would occur with fire. To achieve thinning of small pine, juniper, and aspen, a prescription favoring higher flame lengths and greater heat would be required. This type of fire would consume more coarse woody material, litter and duff. Some of the finer material would be replaced within 10 to 15 years when the killed trees drop their needles and begin to decay and fall to the ground.

An occasional group of second-growth overstory trees and a few of the larger, old pine would likely be killed with a hotter burning prescription under alternative 3. This alternative would provide a more diverse stand structure than Alternative 2, but would not favor the maintenance and enhancement of old structure habitat as much as Alternative 1. Losses from insects and disease, especially bark beetles, would likely be greater under Alternative 3 than under Alternative 1 or 2.

More dead ladder fuels would be left in the short-term. If periodic maintenance burns were implemented over a long period of time (decades) then the threat of a stand-replacement fire would be greatly diminished under Alternative 3.

Alternative 4 (No Action)

The No Action Alternative would not achieve the desired vegetative management objectives. The encroachment of pine and juniper into aspen communities would continue. Pine and juniper would continue to overtop aspen, increasing shade and preventing aspen from regenerating. Aspen stands would continue to decline in density, area, and viability. Without management or natural disturbance, aspen clones in the project area would eventually become extinct. Habitat diversity would decline with the replacement of aspen and associated plant communities with dense pine and juniper.

Old ponderosa pine forest structure would not be maintained or enhanced. Remaining large overstory trees would continue to decrease at a relatively high rate. Recruitment of pine/juniper regeneration would continue. The stocking level would continue to increase while stand health and growth would

decline. Opportunistic insects and disease could increase from endemic to epidemic levels. High competition and insect/disease mortality would add to the already high fuel loading. The probability of a large, intense wildfire would increase with additional down fuels, high density stems, closed canopies, and ladder fuels. If an intense crown wildfire were to occur, it could destroy a high percentage of the remaining large trees, and possibly the aspen clones as well.

Existing road and skid trail closures would not occur. Some impacts to vegetation would continue from occasional off-road vehicle traffic in the project area.

**C. Wildlife**

Alternative 1 (Proposed Action)

Implementation activities would cause disturbance to animals using the area during operations, but the impacts would be short-term and localized to a small area. Operating activities would be outside of critical periods of the year.

Removing the understory pine and juniper would increase the survival and reproduction of the aspen and large trees. Because these habitat components are some of the most desirable habitat conditions for wildlife in the watershed, protecting and enhancing them would be very beneficial. Slash piles that remain at the landing sites after treatment would benefit ground nesting birds like turkey and quail and would provide hiding cover and possible dens for small mammals.

Closing roads and skid trails would improve the habitat effectiveness for game animals and increase the area producing forage. The increased slash available from thinning activities would make road closure efforts more effective.

Prescribed fire activities have the potential to cause some snags, green trees, and down logs to burn up or fall over. Pulling back the fine fuels from around these features would greatly reduce this risk. Given the timing of the burning and the removal of debris this alternative would have snag and down log levels towards the high end of what would have historically occurred on sites like these. Additionally, live trees would be girdled after treatment activities which would increase the number of snags. Burning activities would be expected to increase the production and palatability of forage species for big game.

Alternative 2

Thinning trees up to nine inches dbh would have beneficial impacts similar to Alternative 1 but would not reduce the risk of competition with aspen and larger pine from trees in the 9 to 18 inch dbh size classes. This alternative would also not have any post-treatment burning so there would be less potential for loss of existing snags and down logs. Additional slash piles left from the piling of non-

commercial thinning concentrations would provide more habitat for ground nesting birds and small mammals than alternatives 1, 3 or 4. Closure of roads and skid trails would be more effective with a higher amount of slash left on-site.

Alternative 3

Prescribe fire is a less discriminating tool than mechanical treatments. Prescribed fire would have beneficial effects by removing competing conifers; however, there is greater risk of losing existing aspen and large pine components. It is unlikely that prescribed fire would be able to kill many competing trees greater than nine inches dbh without removing the desirable larger pine. Multiple burns also increase the risk of burning through the base of large pines and snags and consuming down woody material.

This alternative would also require additional fireline. Firelines, skid trails, and a portion of the access road would be closed, however, the closures may not be as effective at keeping vehicles out because no thinning slash would be created and available to use for closing and disguising these areas. This would increase the potential of off-road vehicle use and associated disturbance near these critical habitat components.

Alternative 4 (No Action)

The No Action alternative accepts the risk that these stands would continue to become choked out by competition and that valuable habitat components would continue to be lost. These habitat elements are currently below their historic levels on a landscape scale. Choosing to allow these stands to move in the direction they are headed would further reduce these critical habitats.

**D. Threatened, Endangered, and Special Status Species**

Documentation of surveys, habitats, and effects analysis are contained in the Biological Evaluation\Biological Assessment Review (Project File - BLM Prineville District Office).

Alternative 1 (Proposed Action)

There is no habitat designated “critical” or “essential” for any listed species in the project area. The modifications to vegetation structure and composition would have beneficial effects for all listed and sensitive species with habitat potential in the project area.

Opening the structure of the stand and allowing for greater shrub, aspen, and herbaceous growth would enhance small mammal and bird populations, which should enhance foraging opportunities for

pygmy owl, goshawk, bald eagle, lynx, and fisher.

Road closures would reduce human disturbance, reduce the potential for illegal felling of snags, decrease fragmentation of micro habitats, and increase forage production that would be expected to benefit all TE&S species. This is particularly true for species sensitive to human presence like lynx and fisher.

Several of the sensitive species are dependant on large pine trees for foraging and nesting. Thinning activities would enhance the development of large ponderosa pine. No dead trees with potential nest cavities would be cut down. This would ensure that any perches used for foraging purposes would be retained.

Burning activities would consume some of the down wood and have the potential to cause existing snags to fall over or to kill live trees. Protection of large pine from fire damage would increase retention of large snags for nesting and large diameter live trees for foraging in the future.

Implementation activities have the potential to disturb incidental foraging or travel activities; however, an area less than 80 acres would be affected at any one time. Other areas with equal or higher potential for foraging and dispersing exist all around the project area. If the project area is being used as a portion of a reproductive core, most nesting activities would be completed and young fledged prior to the project beginning. Trees or snags with nests would not be felled.

Alternative 2, 3

Alternative 2 and 3 have the potential for loss of more of the large ponderosa pine trees and continued decline of aspen stands. Implementation impacts of Alternative 2 would be less than Alternative 1; however, due to the multiple entries associated with Alternative 3, there would be greater direct disturbance impacts on wildlife.

Alternative 4 (No Action)

Like Alternative 2 and 3, Alternative 4 would have higher potential for loss of critical habitat components. There would be no implementation impacts associated with Alternative 4.

**Sensitive Plant** - With proposed mitigation measures, none of the action alternatives are expected to have any adverse impacts on suspected *Calochortus* habitat.

**E. Air Quality**

Alternative 1 and 3 - The project is located 65 miles east of Bend and very few scattered ranches occur within a 30 mile radius. Smoke generated from prescribed burning would be locally heavy, but

would be short-term and disperse quickly. Burning would occur during favorable wind patterns which would carry smoke away from populated areas. Dust generated from operations involving vehicle traffic but would be temporary and minor.

Alternative 2 and 4 - No impacts to air quality would occur.

**F. Other Resources**

The following critical elements were considered, but will not be addressed because they, either do not exist in the project vicinity, would not be affected, or effects would be negligible.

1. Agricultural Lands, Prime or Unique - none
2. Areas of Critical Environmental Concern - none
3. Drinking Water Quality - no effect
4. Environmental Justice - no effect
5. Fisheries - no effect
6. Floodplains - none
7. Livestock Grazing - no effect
8. Cutural Resources / Native American Religious Concerns - no sites identified (inventory documentation available for review at the BLM Prineville District Office).
9. Paleontological Resources - no sites identified
10. Recreation - no effect
11. Riparian/Wetlands - no effect
12. Wastes, Hazardous or Solid - none
13. Wild and Scenic Rivers - none
14. Wilderness - none

**G. Cumulative Effects**

As previously noted, the project area has been logged with a selection harvest at least twice in the last 50 years. The last entry occurred in the late 1970s. The BLM is currently implementing a ponderosa pine/Douglas-fir thinning, underburning, and aspen treatment project (South Boundary) located approximately eight miles to the west. The project has similar objectives to this proposed action with prescribed burning on 3,600 acres and thinning on approximately 500 acres. The BLM has implemented a prescribed burn of 1250 acres (Dippy Beaver) in 1997-98, approximately six miles to the east. The USDA Forest Service has done several non-commercial and commercial thinning and overstory removal projects within the last 20-30 years on the Ochoco National Forest adjacent and to the north of the project area.

**V. CONSULTATION/COORDINATION**

(all BLM personnel except as noted)

Lyle Andrews, Rangeland Management Specialist
Steve Castillo, Forester
Dale Ekman, Fuels Specialist
Scott Goodman, Archaeologist
Ron Halvorson, Botanist
Jan Hanf, Wildlife Biologist
Monte Kuk, Wildlife Biologist
Mark Lesko, Botanist/Forester (USFS & BLM)
Michelle McSwain, Hydrologist
Barb Mountz, Forester (USFS)
Berry Phelps, Outdoor Rcreation Planner
Fayne Ritch (adjacent landowner)
John Swanson, Rangeland Management Specialist
Don Zalunardo, Rangeland Management Specialist

NEPA Requirements met:

/s/ Danny L. Tippy 03/05/01
Environmental Coordinator Date

**APPENDIX A - MITIGATION AND MONITORING MEASURES**

This section describes mitigation and monitoring measures and project details designed to limit adverse environmental impacts or enhance project effectiveness. All items apply to Alternative 1, the proposed action, but also would be incorporated into the other action alternatives where applicable.

- Operations utilizing equipment would be restricted to the period between July 15 and September 30. In addition, during extreme precipitation events, some operations may be suspended to limit impacts to roads and soils.

- Existing roads, skid trails and landings would be used. In thinning treatment areas without adequate existing skid trails or landings, additional skid trails and landings would be designated. No additional access roads would be constructed.

- Equipment would not be allowed to enter or cross wet seep areas. Small wet sites with aspen within units would either be excluded or "line pulling" would be required where thinning is to occur.

- Thinning slash would be scattered on-site to disperse fuel concentrations, protect soils, retain organic matter, promote nutrient cycling, provide cover for small wildlife, and protect emerging aspen, grasses and forbs.

- Limited salvage of small tree thinning slash (for firewood and fence posts) may occur where easily accessible near existing roads to help reduce fuel loading and need for piling.

- All existing snags eight inches dbh and larger would not be cut or disturbed.

- Up to 50 larger ponderosa pine (12 to 18 inches dbh) would be girdled that; are needed in snag deficient areas (less than two snags per acre greater than 12 inches dbh), are needed where existing snags are in advanced stages of decay, are severely infected with dwarf mistletoe where it may spread, or, are in close proximity to aspen or other sensitive areas where conifers are competing.

- Large (12 inches or greater) down logs would be retained. Measures, such as timing, avoidance, slash pull-back, and hand firelines would be used to protect down log habitat from destruction/disturbance from prescribed fire and logging operations.

- Leave areas for wildlife cover and connectivity would be retained between underburning and thinning treatment units.

- Prescribed burning would be conducted during fuel and weather conditions which would allow for a variable consumption and spread pattern for a high degree of diversity. After burning, it is expected that approximately 20 to 40 percent of the burn area would be left in a mosaic pattern of unburned islands and fingers.

- Monitoring would be done before and after burning to evaluate effects on down logs, snags and green trees. Prescriptions and protection measures would be modified, if necessary, to limit losses.

- Prescriptions for burning would include weather conditions that would allow rapid dispersal of smoke away from populated areas. Prescribed burns would be in compliance with the Oregon State Smoke Management Plan. Nearby ranches would be contacted prior to ignition.

- Smoke management associated with any burning would consider the direction and timing of the smoke in relation to the bald eagle nests located four miles southwest of the project area and seven miles southeast of the project area.

- Malformed green trees, such as those with mistletoe induced "witch's brooms," snow, ice, wind and lightning breakage, porcupine girdled tops, and those with other disfigured branches and tops, would be left to provide additional nesting and perching habitat diversity for birds and small mammals. Large leave trees with heavy mistletoe infections ("Hawksworth" Rating 5-6) would be isolated with a 20 to 30 foot thin spacing from adjacent healthy trees.

- On an estimated 10 to 20 percent of area (under alternative 2) where fuels loading would be too high for spreading, piling would be necessary. All piles would be left unburned to provide denning and cover habitat for small mammals, ground nesting birds and reptiles.

- Primary skid trails and firelines would be rehabilitated following use by covering with slash, rocks, and large woody debris.

- Upon completion of project activities, approximately 0.75 mile of existing road and public-created tributary wheel tracks would be closed and rehabilitated. The closure technique would be to cover/disguise roads with rocks, slash, and large woody debris. Waterbars or other drainage features would be constructed or reconstructed on portions of the access road where slope exceeds seven percent.

- Exclosure fences would be installed as needed around aspen stands to protect aspen suckers from wildlife and livestock. Exclosures would be monitored and maintained annually for at least three years. When aspen regeneration reaches sufficient density and height to withstand ungulate browsing pressure, fences would be removed.

- Additional forage production occurring as a result of thinning would be made available to wildlife (would not be allocated to livestock).

- Weeds, such as houndstongue and thistles, would be monitored and managed in accordance with the Prineville District Integrated Weed Management Environmental Assessment OR-053-3-062 (March, 1994).

- At any time during operations, if a Threatened, Endangered or other special status plant or animal species is located or identified in or adjacent to the project area, the operation would be suspended and measures would be taken as directed by a Wildlife Biologist or Botanist to avoid or protect the habitat as appropriate (Sec. 41 Special provisions, (D) Environmental Protection, Clause 1 and 2). Additional Goshawk surveys would be completed prior to any activities beginning and modifications would be made to the contract if a goshawk nest is located within or in close proximity to the project area. Modifications would be made if it is determined the project area is critical to the success of this reproductive home range.

- A cultural resource inventory did not identify any sites in the project area. Any human remains or cultural and/or paleontological resources discovered during operations would be immediately reported to the area Archaeologist. All operations in the vicinity of such discovery would be suspended pending recommendations by the Archaeologist.

- Monitoring would include, but not be limited to, contract compliance inspections, internal and external field trips, photo points, weed inventory/assessments, prescribed fire prescription monitoring, post-burn evaluations, aspen response and animal browse evaluations, and exclosure fence inspections/maintenance. Monitoring field trip results, conclusions, and follow-up treatment recommendations would be recorded in writing and added to the project file.

## LITERATURE CITED

Agee, J.K. 1990. Fire History and Ecology in Pacific Northwest Forests. 1990 Pacific Northwest Range Management Short Course, Oregon State Univ. Press, Corvallis, OR. P6-11.

Bradley, A.F., Fischer, W.C., Noste, N.V. 1992. Fire Ecology of the Forest Habitat Types of Eastern Idaho and Western Wyoming. USDA Forest Service General Technical Report INT-290. 74p.

Brothers/LaPine Resource Management Plan. 1989. Prineville District, Bureau of land Management.

Johnson, N.K., J. Agee, R. Beschta, J. Beuter, S. Gregory, L. Kellogg, W. McComb, J. Sedell, T. Schowalter, S. Tesch. 1995. Forest Health and Timber Harvest on National Forests in the Blue Mountains of Oregon, A Report to Governor Kitzaber.

Lachowski, H.J., T. Powell, P. Wirth, P. Maus, K. Suzuhi, J. McNamera, P. Riordan, and R. Brohman. 1996. Monitoring Aspen Decline Using Remote Sensing and GIS: Gravelly Mountain, Landscape, Southwestern Montana. Dillion, MT: Beaverhead National Forest.

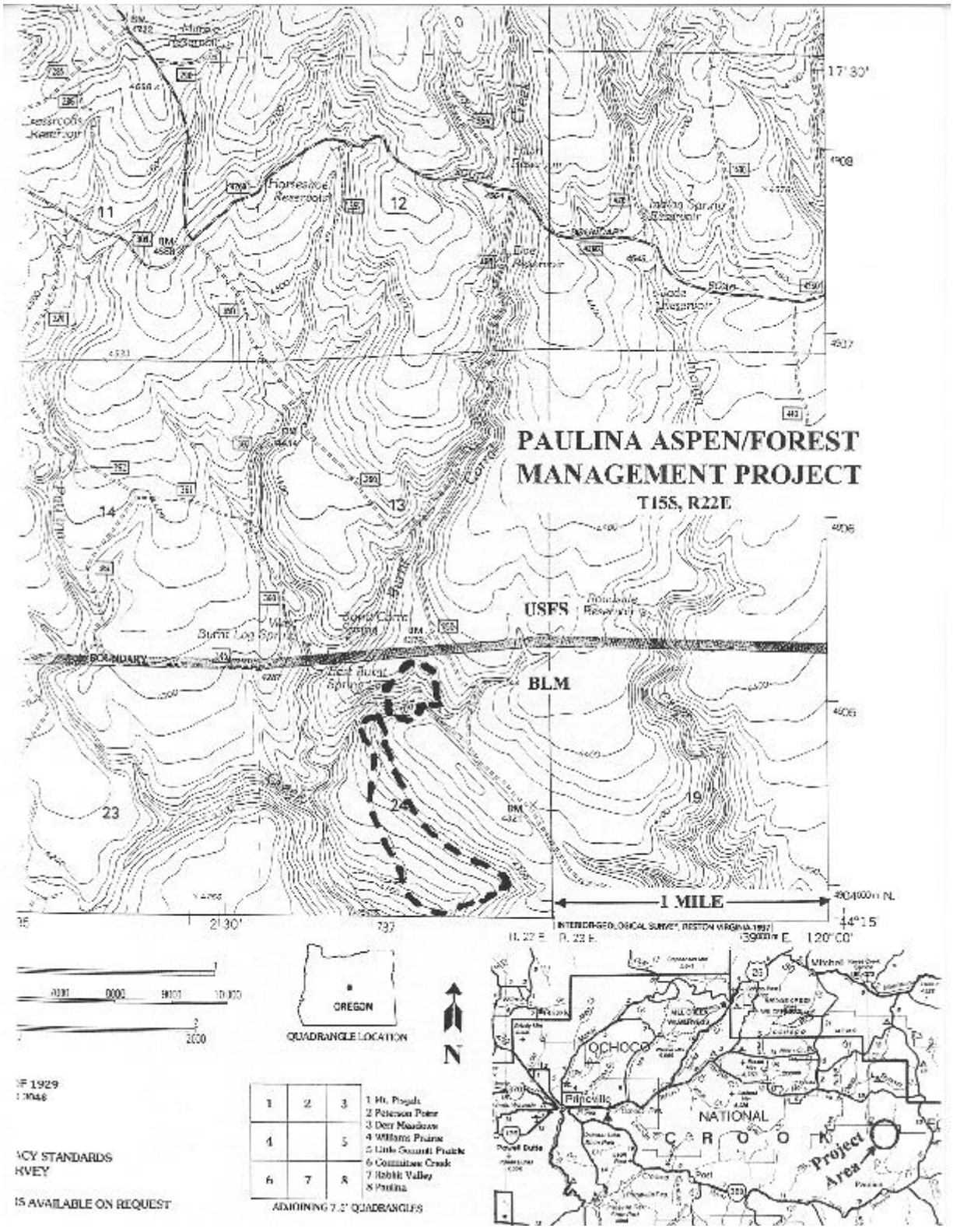
Mueggler, W.F. 1989a. Age Distribution and Reproduction of Intermountain Aspen Stands. Western Journal of Applied Forestry 4(2):41-45.

_____. 1989b. Status of Aspen Woodlands in the West. In Western Raptor Management Symposium and Workshop, ed. B.G. Pendleton, 32-37. Scientific and Technical Series No. 12. Washington DC: National Wildlife Federation.

Quigley, T.A., and S.J. Arbelbide. An Assessment of Ecosystem Components in the Interior Columbia Basin. PNW-GTR-405. USDA Forest Service and USDI Bureau of Land Management.

Shepperd, W.D., and O. Engelby. 1983. Rocky Mountain Aspen: 77-79. In Silvicultural Systems for the Major Forest Types of the United States. USDA, Ariculture Handbook 445, 191p. Washington DC.

Weaver, H. 1959. Ecological Changes in the Ponderosa Pine Forest of the Warm Springs Indian Reservation in Oregon. Journal of Forestry 41:7-15.


PAULINA ASPEN/FOREST
MANAGEMENT PROJECT
T15S, R22E
USFS
BLM
BOUNDARY
1 MILE
OREGON
QUADRANGLE LOCATION
N
OCHOCO
Prineville
NATIONAL
Project Area
ADJOINING 7.5' QUADRANGLES
1 Mt. Pisgah
2 Peterson Point
3 Deer Meadows
4 Williams Prairie
5 Little Summit Prairie
6 Committee Creek
7 Rabbit Valley
8 Paulina